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Review

Practical aspects and training in fibreoptic intubation

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ABSTRACT

Flexible fibreoptic bronchoscopy has been an integral part of difficult airway management since it was first described in 1967. Since then, its use has evolved alongside the development of new drugs, practices and airway equipment. This article firstly aims to highlight the assessment of the difficult airway and to evaluate the role of fibreoptic intubation in the anticipated or unanticipated difficult airway. Secondly, we review the current evidence for the practical aspects of fibreoptic intubation, including manipulation of the scope, airway topicalization and sedation as well as tips for overcoming technical problems. Subsequently, our article addresses the importance of education and training in fibreoptic intubation, the lack of which have been shown in the UK's 4th National Audit Project to be contributory factors in major airway complications [1]. Finally, we discuss ethicolegal concerns relating to consent for training and justification of non-routine intubation techniques.

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1. Introduction

The armament of the anaesthetist for tracheal intubation has expanded from direct laryngoscopy with the ubiquitous Macintosh laryngoscope, to more advanced techniques relying on indirect laryngoscopy such as the fibreoptic bronchoscope (FOB) [2,3], which is regarded as the 'gold standard' in the difficult airway. The development of new drugs and delivery methods such as Target Controlled Infusion (TCI) has also improved the conditions under which fibreoptic intubation (FOI) is performed. However, the rise in popularity of supraglottic airway devices (SAD) and video-laryngoscopes (VL) over fibreoptic intubation for airway management has heralded a decline in the use of FOI. Despite this, the role of FOI in the difficult airway continues to feature prominently in the algorithms of the management of both the anticipated and unanticipated difficult airway.

The decline in the use of FOI with the increasing popularity of alternative methods of airway management [4] has also consequently led to FOI skill atrophy [4]. Nevertheless, education and training in FOI remains vital, as these have been shown in the UK's 4th National Audit Project to be contributory factors in major airway complications [1].

This review article aims to emphasize the importance of the role of the fibreoptic bronchoscope in the management of the anticipated and unanticipated difficult airway in airway algorithms. The latest literature on the practical aspects of FOI are also reviewed in view of the refinement of different techniques over the past decade. These include airway topicalization and sedation to achieve ideal intubating conditions, manipulation of the bronchoscope, technical problems encountered and solutions to overcome these problems, as well as new developments in the use of FOB such as high flow oxygen insufflation. This article goes on to discuss the importance of training to attain competency in FOI use and the ethicolegal concerns of using actual patients for skills training since FOI is an essential airway skill that every anaesthetist should have.

2. The difficult airway

After careful airway assessment, a logical and stepwise airway strategy must be in place prior to securing the airway. Assessment of the airway involves identifying any factors in the history and physical examination that indicate a difficult airway. Radiological imaging can be used to identify any anatomical abnormalities. The important role of FOI in a difficult airway cannot be emphasized enough—the UK's 4th National Audit Project identified patients with predictors of difficult intubation but in whom FOI was not considered, resulting in repeated unsuccessful attempts at airway manipulation with different airway devices, many of whom had adverse outcomes [1].

2.1. Mask ventilation and direct laryngoscopy

Mask ventilation is essential in airway management, where the priority would be to maintain oxygenation. Predictors of difficult mask ventilation include age >57 years, body mass index >30 kg/m^2, presence of a beard, limited jaw protrusion, Mallampati III or IV [5] and the presence of snoring [6]. Predictors of difficult laryngoscopy include a high Mallampati score, short inter-incisor distance or thyromental distance and limited mandibular protrusion or neck extension. These have low to moderate predictive value, and so a proportion of difficult airways will continue to remain unanticipated [7].

2.2. Imaging

Computed tomography (CT) or Magnetic Resonance Imaging (MRI) of the neck and airways may be useful in delineating airway anatomy and identifying any potential sites of distortion/obstruction, but may not be practical or safe to be performed in patients with acutely obstructed airways or cardio-respiratory compromise. New developments such as percutaneous ultrasound imaging of airway anatomy have been described—bony structures, cartilaginous structures of the airway and vocal cords can be easily visualised, however, the posterior wall of the trachea and pharynx cannot be visualised due to artefactual distortion by air [8,9]. Nonetheless, ultrasound can be used to evaluate airway pathology (e.g. hemangiomas, laryngeal stenosis) and can be used to predict difficult laryngoscopy [10]. A recent meta-analysis by Fulkerson et al. found that increased hyomental distance, anterior tissues at the hyoid bone and thyrohyoid membrane measured ultrasonically correlated with difficult laryngoscopy [11]. However, further evidence and increased familiarity would be required for it to be used routinely as an airway screening tool.

3. Fibreoptic intubation

3.1. Design of the intubating fibreoptic bronchoscope

The FOB is considered by some authors to be the 'gold standard' for performing indirect laryngoscopy for difficult airways [12]. It consists of three main parts: handle with a control lever, insertion cord and flexible tip. The insertion cord consists of two bundles of delicate glass fibreoptic cables, one allowing light to be carried from the source to the eyepiece and the second conducting the image from lens to the eyepiece. For tracheal intubation, the FOB is preloaded with a tracheal tube and carefully manipulated, either via

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